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**ADDENDUM TO INTERIM MEASURES WORK PLAN  
EAST HELENA FACILITY  
  
FORMER ACID PLANT SEDIMENT DRYING AREA  
SLURRY WALL  
MONITORING, OPERATION, AND MAINTENANCE  
WORK PLAN**

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**October 18, 2006**

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## **LIST OF EXHIBITS**

**SHEET NUMBER 1 SEDIMENT DRYING AREA CAPPING PLAN**  
(jsd\hel\10806\i:\land projects\60520\dwg\605201h003.dwg)

## **1.0 INTRODUCTION**

A Consent Decree effective May 5, 1998 between U.S. Environmental Protection Agency (EPA) and ASARCO LLC (Asarco) (U.S. District Court, 1998) initiated the corrective action process in accordance with the RCRA program. As part of the Consent Decree, Asarco prepared several site investigation documents including:

- RCRA Current Conditions/Release Assessment (CC/RA) (Hydrometrics 1999a).
- Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b).
- RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000a)
- Phase I RCRA Facility Investigation Report (Asarco Consulting Inc. (ACI) 2003, revised 2005).

A complete listing of RCRA Consent Decree documents is contained in the Phase I RCRA Facility Investigation (RFI) report.

As part of the Consent Decree, several interim measures have been implemented for groundwater between 1999 and 2001. These earlier interim measures (IM) performed as part of the Consent Decree are discussed in Section 1.2 of the RFI. In May 2002, a RCRA Interim Measures Work Plan Addendum (IMWPA) was prepared (Hydrometrics, 2002). The 2002 IMWPA addressed groundwater impact concerns in the intermediate aquifer within the City of East Helena and down-gradient residential groundwater supplies north of the Asarco plant site. These interim measures are discussed in Section 1.2.1.3 of the IMWPA.

The RFI addresses remaining elements of the site that are not addressed as part of the IM process and will provide sufficient data to develop corrective measures alternatives. The information gathered by the RFI will be used to prepare a RCRA Corrective Measures Study (CMS) for the East Helena Facility. The RFI is being conducted in two phases. The Phase I RFI addressed site characterization that has not been addressed in previous

investigations or IM efforts. The Phase II RFI will consist of an assessment of human health and ecological risk. As part of Phase II, a Risk Assessment (RA) Work Plan will be developed in consideration of the data and evaluation presented in the Phase I RFI Site Characterization Report. The Phase II RA Work Plan will address risk assessment objectives, additional data requirements, and procedures for conducting the risk assessment. The development of the Phase II RFI Risk Assessment is discussed in Section 7.0 of the RFI report.

### **1.1 PROPOSED INTERIM CORRECTIVE MEASURES FOR GROUNDWATER**

EPA has expressed its preference for passive corrective measures for control of groundwater at the East Helena site. These measures could include in situ containment such as slurry walls and capping, or in situ treatment options such as soil fixation or permeable barrier walls. As a result of discussions between EPA, Asarco and MDEQ, groundwater corrective actions will focus on three general areas:

1. The former acid plant sediment drying area,
2. The speiss/dross area, and
3. The elevated groundwater arsenic plume down-gradient from these areas.

As a result of the April 2006 meetings between Asarco, EPA and MDEQ, and the follow-up of several action items as a result of the meetings (including preparation of cost estimates by engineers and contractors), the general strategy for groundwater corrective actions at the East Helena Facility is as follows:

- Slurry wall construction and capping of the former acid plant sediment drying area. The general trace of this proposed slurry wall is shown on Figure 1-1.
- Slurry wall construction and capping of the speiss/dross area.
- Construction of a PRB near the area of the present PRB test wall.

The Groundwater Corrective Action Plan - 2006 (Asarco, August 2006) presented the conceptual design for implementation of these actions. In 2006, groundwater remedial

actions are focused on construction of a slurry wall in the former acid plant sediment drying area. As part of implementation of this project, several work plans have been prepared that address construction of a slurry wall and temporary cover in the former acid plant area including:

- 2006 Phase 1, Phase 2 and Phase 3, Final Cleaning, Soil Sampling Backfilling and Interim Cap Work Plan (Asarco, 2006b) ( This document addresses the temporary cover design that will be constructed in the former acid plant sediment drying area)
- Design Basis Memorandum, Asarco Former Acid Plant Sediment Drying Area Slurry Wall, East Helena, Montana (Shaw E&I 2006a)
- Work Plan, Former Acid Plant Sediment Drying Area Slurry Wall, October 4, 2006 (Shaw E&I 2006b)
- Construction Quality Control Plan, Former Acid Plant Sediment Drying Area Slurry Wall (Shaw E&I 2006c), and
- Site Specific Health and Safety Plan for Slurry Wall Construction at the Former Sediment Drying Area (Shaw E&I 2006d),
- Permeability Testing for Slurry Cutoff Wall Memorandum, (Shaw E&I 2006e) and,
- Permeability Testing for Slurry Wall Cutoff Wall, Asarco East Helena, Montana, October 9, 2006, GeoSolutions Inc., 2006.

The design for a slurry wall around the former acid plant sediment drying area will include the following features:

- The wall is 800 feet long, 33 feet deep and 3 feet wide.
- The wall would be keyed 2 feet into the underlying low permeability ash unit.
- The wall can be constructed using excavation equipment used for the test PRB
- Standard bentonite grout will be used for slurry wall construction.

## **1.2 2006 IM WORK PLAN ADDENDUM SCOPE AND OBJECTIVES**

The objectives of this 2006 IM Work Plan Addendum for slurry wall monitoring, maintenance and operation are:

- Present the monitoring well network that will be used to monitor the effectiveness of the slurry wall and cap area after construction is complete,
- Present the testing and sampling program for the slurry wall area, and
- Present operation and maintenance procedures.

## **2.0 FORMER ACID PLANT SEDIMENT DRYING AREA MONITORING AND TESTING PROGRAM**

The performance of the slurry wall will be monitored using existing and new monitor wells in the former acid plant sediment drying slurry wall area. The slurry wall monitoring network is shown on Figure 1-1. A total of 10 existing wells, five new wells, and two surface water level sites will be used to assess performance of the wall after construction is complete. Slurry wall performance will be monitored by:

- Monitoring groundwater levels inside the wall area, within the wall itself, and up and down gradient of the wall.
- Collection and analysis of groundwater quality samples within the wall and down gradient of the wall to monitor future changes over time.
- Direct measurement of wall permeability by conducting slug tests to measure wall permeability characteristics.

Table 2-1 summarizes the slurry wall testing and sampling program.

### **2.1 CONSTRUCTION OF NEW MONITORING WELLS**

A total of five new monitoring wells (APSD-15 through APSD-19) will be added to the ten existing monitoring wells (DH-29, DH-45, DH-46, DH-47, APSD-1, APSD-2, APSD-3, APSD-4, APSD-10, APSD-12). Table 2-2 summarizes the supplemental well installation program. Four of the new wells (APSD-15, APSD-16, APSD-17, and APSD-18) will be constructed within the wall. These wells will be installed either during wall construction, or drilled in the wall after construction of the wall is completed. In general, the wells will be typical shallow monitoring well construction consisting of 2-inch I.D. NFS approved schedule 40 PVC with flush joint couplings and factory slotted screen. Figure 2-1 shows typical construction details. If the wells within the walls are installed concurrently with construction of the wall, pre-pack screen sections will be used. Well APSD-19, will be installed just outside the wall in the direction of downgradient



groundwater flow to examine adjacent water levels and groundwater quality changes in the wall area.

Well construction will include documentation, and sampling using procedures and techniques defined in the EPA approved IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000a). The well located outside the wall will be construction using air rotary methods, necessary to drill through the extensive boulders, cobbles, and gravel typical of the East Helena facility area. All wells and boreholes will be logged for stratigraphy and completed by a professional scientist or engineer.

## **2.2 GROUNDWATER MONITORING AND TESTING PROGRAM**

Table 2-1 summarizes the slurry wall monitoring and testing program. Groundwater samples will be collected and analyzed for field parameters, dissolved metals and arsenic, and common ions. The sampling and measurement procedures will be conducted in accordance with the IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000a). Concurrent with sample collection, water levels of all monitoring wells will be measured. Slurry wall groundwater monitoring will be conducted quarterly for the first year. After 1 year, the data will be reviewed and pending results, the monitoring frequency at that time may be reduced to semiannual monitoring and conducted concurrently with the spring and fall long-term post-RI/FS monitoring program for the East Helena Site.

In addition to water level measurement, slug testing will be conducted on the new wells (APSD-15 through APSD-19) to determine permeability characteristics. Permeability tests will be conducted prior to sample collection in anticipation that available water for testing in wells completed in the slurry wall may be limited. Testing will be conducted in accordance with procedures described in the IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000a).

### **3.0 SLURRY WALL AND CAP OPERATION AND MAINTENANCE PLAN**

#### **3.1 SLURRY WALL O&M**

Following installation, minimal maintenance of the wall is anticipated. As described above, the performance of the wall will be evaluated through water level monitoring, water quality sampling, and field permeability testing.

Periodic inspections of the wall construction area will be conducted to monitor the wall footprint for settling following completion of the wall. Some minor settlement is anticipated. If necessary, additional fill may be added to maintain the design drainage of the area. In general operation and maintenance actions will be incorporated as part of the drainage and cap inspections for the area (see Section 3.2 below)

#### **3.2 TEMPORARY CAP O&M**

In addition to slurry wall construction in 2006, the area within the slurry wall will include a temporary cover as described in the Interim Cap Work Plan (Asarco 2006b). A temporary cover will be installed instead of a permanent cover in 2006 since demolition of additional structures adjacent to the slurry wall area is anticipated in either 2007 or 2008 (see Figure 1-1, near wells DH-45 and DH-46). Following completion of this activity, a permanent cap would be installed as described in the Groundwater Corrective Action Plan (Asarco 2006a). Sheet Number 1 shows details for the temporary cap and drainage plan for the slurry wall area in the former acid plant sediment drying area.

Temporary cap O&M procedures are described in the Interim Cap Work Plan. (Asarco 2006b) Periodic inspections of the interim cap will be conducted to ensure that the interim cap systems are performing adequately and to identify problems and provide proper maintenance of interim cap systems. The inspection program will involve three types of inspections: (1) informal inspections, (2) periodic technical inspections, and (3) special inspections after extreme events (see Section 2.6, Interim Cap Work Plan, Asarco 2006b).

#### 4.0 SLURRY WALL PROGRAM SCHEDULE

Slurry wall construction is anticipated to begin the week of October 23, 2006. The following schedule outlines the anticipated slurry wall monitoring, testing, and O&M activities for the former acid plant sediment drying area.

• Construct slurry wall	• October 23 2006 through November 10, 2006
• Construct new monitoring wells within slurry wall	• October 23 2006 through November 10, 2006
• Grade area, maintain drainage controls and install temporary cover	• November 13-17, 2006
• Construct new downgradient monitoring well adjacent to slurry wall	• November 13, 2006
• Perform slug tests in new monitoring wells	• November 15 – 17, 2006.
• Conduct water level measurement and water quality sampling	• November 20 – 21, 2006 • February 2007 • May 2007 • August 2007 • November 2007
• Evaluation of slurry wall performance	• November 2006 through January 2008
• Conduct wall and temporary cap inspections. Provide maintenance as necessary	• Monthly, and/or after special events (rain, wind quake, etc).

## **5.0 REFERENCES**

- Hydrometrics, 2000c. Groundwater Source Control Interim Measures Design Analysis, Plans and Specifications, East Helena Facility, March 2000.
- Hydrometrics, 1999b. Interim Measures Work Plan, East Helena Facility, April 1999, Revised July 1999. Includes Volume II, Corrective Action Management Unit Design Report.
- Asarco, 2006a. Asarco East Helena Smelter, Groundwater Corrective Action Plan – 2006, August 30, 2006.
- Asarco, 2006b. Asarco East Helena Smelter, 2006 Interim Measures Work Plan Addendum, 2006 Phase 1, Phase 2 and Phase 3, Final Cleaning, Soil Sampling Backfilling and Interim Cap Work Plan, September 26, 2006.
- GeoSolutions Inc., 2006. Permeability Testing for Slurry Wall Cutoff Wall, Asarco East Helena, Montana, October 9, 2006.
- Shaw E&I, 2006a. Design Basis Memorandum, Asarco Former Acid Plant Sediment Drying Area Slurry Wall, East Helena, Montana, October 3, 2006.
- Shaw E&I, 2006b. Work Plan, Former Sediment Drying Area Slurry Wall, October 4, 2006.
- Shaw E&I, 2006c. Construction Quality Control Plan, Former Sediment Drying Area Slurry Wall, October 4, 2006.
- Shaw E&I, 2006d. Site Specific Health and Safety Plan for Slurry Wall Construction at the Former Sediment Drying Area, October 4, 2006.
- Shaw E&I, 2006e. Permeability Testing for Slurry Cutoff Wall Memorandum, October 11, 2006.

## **TABLES**

TABLE 2-1. SLURRY WALL GROUNDWATER SAMPLE COLLECTION AND ANALYSIS MATRIX

Sample Location	Purpose	Sampling Frequency	Number of Sampling Events	Total Non-QC Samples	Analytical Parameters	Field and Laboratory Methods <sup>(1)</sup>	Project Detection Limit Goal (mg/L)	Field QC Samples <sup>(2)</sup>		Total Samples
								Field Duplicates	Field D.L. Blanks	
DH-29 DH-45 DH-46 APSD-1 APSD-2 APSD-3 APSD-4 APSD-15 * APSD-16 * APSD-17 * APSD-18 * APSD-19	Monitor groundwater levels and quality inside slurry wall foot print Monitor groundwater levels and quality down-gradient of slurry wall Monitor groundwater levels and quality down-gradient of slurry wall Monitor groundwater levels and quality inside slurry wall foot print Monitor groundwater levels and quality inside slurry wall foot print Monitor groundwater levels and quality inside slurry wall foot print Monitor groundwater levels and quality down-gradient of slurry wall Monitor groundwater levels and quality within slurry wall foot print Monitor groundwater levels and quality within slurry wall foot print Monitor groundwater levels and quality within slurry wall foot print Monitor groundwater levels and quality within slurry wall foot print Monitor groundwater levels and quality down-gradient of slurry wall	Quarterly for 1 Year  Semi-Annual After 1 Year	4	12	<u>Field Parameters</u> pH specific conductance dissolved oxygen temperature SWL (static water level)  <u>Laboratory Parameters</u> <u>Common Constituents</u> pH SC Ca Mg Na K HCO <sub>3</sub> SO <sub>4</sub> Cl TDS TSS Total Alkalinity as CaCO <sub>3</sub>  <u>Trace Constituents<sup>(3)</sup></u> As (tot & dis) Cd (tot & dis) Cu (tot & dis) Fe (tot & dis) Mn (tot & dis) Pb (tot & dis) Zn (tot & dis) As III, As V	HF-SOP-20 HF-SOP-79 HF-SOP-22 HF-SOP-84 HF-SOP-10  150.1 120.1 6010A/7140 6010A/7450 6010A/7770 6010A/7610 310.1 9036 325.2 160.1 160.2 310.1  7060/6010A/6020 7131/7130/6010A/6020 7211/7210/6010A/6020 6010A 6010A 7421/7420/6010A/6020 7950/6010A/6020 SW-846 7061A	        5 5 5 5 5 1  0.005 0.001 0.004 0.02 0.015 0.005 0.02 0.005	1	1	57
APSD-10 APSD-12 Lower Lake Upper Lake	Monitor groundwater levels upgradient of slurry wall Monitor groundwater levels upgradient of slurry wall Measure water level Measure water level	Quarterly for 1 Year  Semi-Annual After 1 Year	4		<u>Field Parameters</u> SWL (static water level)	HF-SOP-10				
APSD-15 APSD-16 APSD-17 APSD-18 APSD-19	Permeability testing (slug tests) within wall Permeability testing (slug tests) within wall Permeability testing (slug tests) within wall Permeability testing (slug tests) within wall Permeability test (slug test) downgradient of wall	One time event	1		<u>Field Parameters</u> SWL (static water level) Slug Tests	HF-SOP-10 Bower Rice				

(1) Samples will be analyzed for total metals and for dissolved constituents (field-filtered through a 0.45 µm filter prior to preservation).

(2) Field methods HF-SOP numbers refer to Standard Operating Procedures (see Quality Assurance Project Plan [QAPP] in Volume III RFI Work Plan (Hydrometrics 2000), Appendix C for details).

Laboratory methods from EPA's Test Methods for Evaluating Solid Waste, SW-846 (1992) or Methods for Chemical Analysis of Water and Wastes (1983). Details on individual analytical methods are given in the RFTWP QAPP (Appendix D).

For trace constituents and major cations, Method 6010 is ICP, Method 6020 is ICP-MS, and other methods are flame or graphite furnace AA.

(3) Field duplicates and blanks will be collected at a minimum frequency of 1 per 20 field samples. One field standard will be submitted with the groundwater samples.

\* Samples will be collected from wells within the slurry wall if enough water is available for sampling. Because of expected low permeability, a three well volume purge before sample collection may not be feasible.

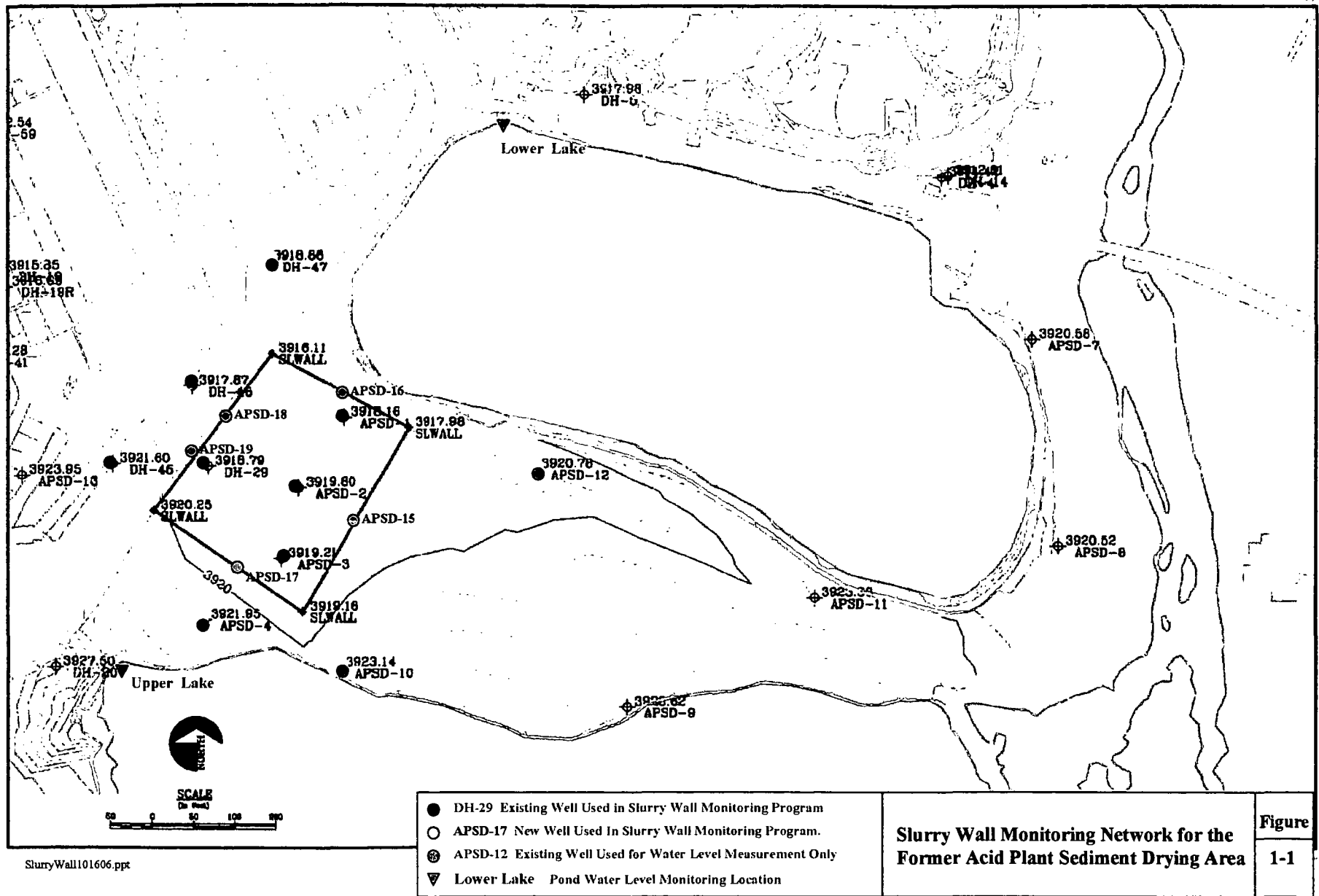
**TABLE 2-2. ANTICIPATED CONSTRUCTION FOR SUPPLEMENTAL SLURRY WALL MONITORING WELLS**

Location	Well Name	Type	Casing Size (inches)	Area of Evaluation	Approximate Ground Surface Elevation (feet)	Approximate Static Water Level (ft bgs)	Anticipated Total Depth (feet)	Total Depth Elevation (feet)	Anticipated Screen Interval (ft bgs)
Former Acid	APSD-15	BH	2	Within the slurry wall.	3919	8	31	3888	6-31
Plant Sediment	APSD-16	BH	2	Within the slurry wall.	3918	8	31	3887	6-31
Drying Area	APSD-17	BH	2	Within the slurry wall.	3919	8	31	3888	6-31
	APSD-18	BH	2	Within the slurry wall.	3918	8	31	3887	6-31
	APSD-19	BH	2	Down-gradient of the Slurry Wall	3919	8	31	3888	6-31

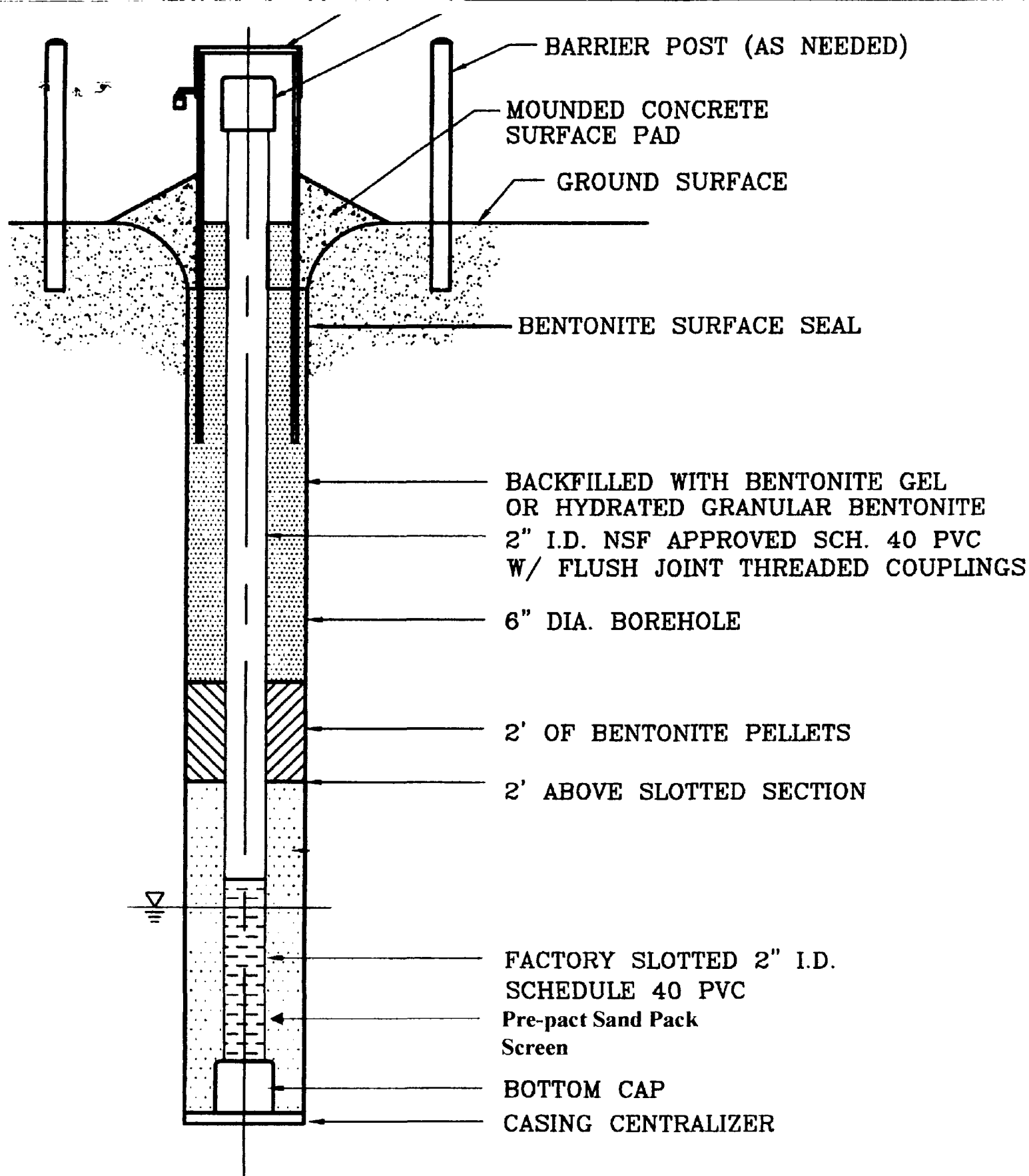
Note: Listed casing size is inside diameter.  
ft bgs = feet below ground surface  
Elevations in feet above mean sea level  
MW = Monitoring Well



## FIGURES



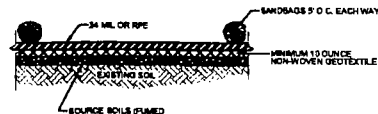
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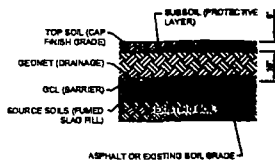
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**NOTES:**

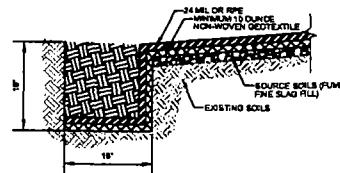
1. BRING ALL LOW AREAS AND DEPRESSIONS UP TO GRADE WITH SUITABLE FILL MATERIAL. ON-SITE GRANULAR SLAG MAY BE USED.
2. PREPARE SUBGRADE BY REMOVING ANY EXPOSED METAL, SHARP OBJECTS, OR ROOTS. SUBGRADE SHALL ALSO BE GRADED TO DRAIN TO STORMWATER DRAINS.
3. NON-WOVEN GEOTEXTILE SHALL BE OVERLAPPED A MINIMUM OF 12 INCHES.
4. REINFORCED POLYETHYLENE (RPE) GEOMEMBRANE SHALL BE OVERLAPPED A MINIMUM OF 18 INCHES AT ALL SEAMS. A 3 INCH REINFORCED BUTYL RUBBER SEAMING TAPE SHALL BE USED TO SEAM OVER THE OVERLAP WITH 3 INCHES OF TAPE COVERING EACH LINER. SEAMS MUST BE CLEAN, DRY AND WARM PRIOR TO TAPING.
5. AREAS WHERE LINERS WILL BUTT AGAINST CONCRETE FOUNDATIONS SHALL BE ATTACHED WITH A MINIMUM OF 8 INCH BUTYL RUBBER SEAMING TAPE WITH 3 INCHES OF TAPE COVERING THE LINER AND 3 INCHES OF TAPE COVERING THE CONCRETE. 2"x6" TREATED TIMBERS SHALL BE ATTACHED TO THE LINER AND CONCRETE WITH CONCRETE ANCHOR BOLTS AS ADDITIONAL SUPPORT. A SIKA-FLEX CAULK SHOULD BE USED TO SEAL ANY AREA NOT SEALED BY SEAMING TAPE.



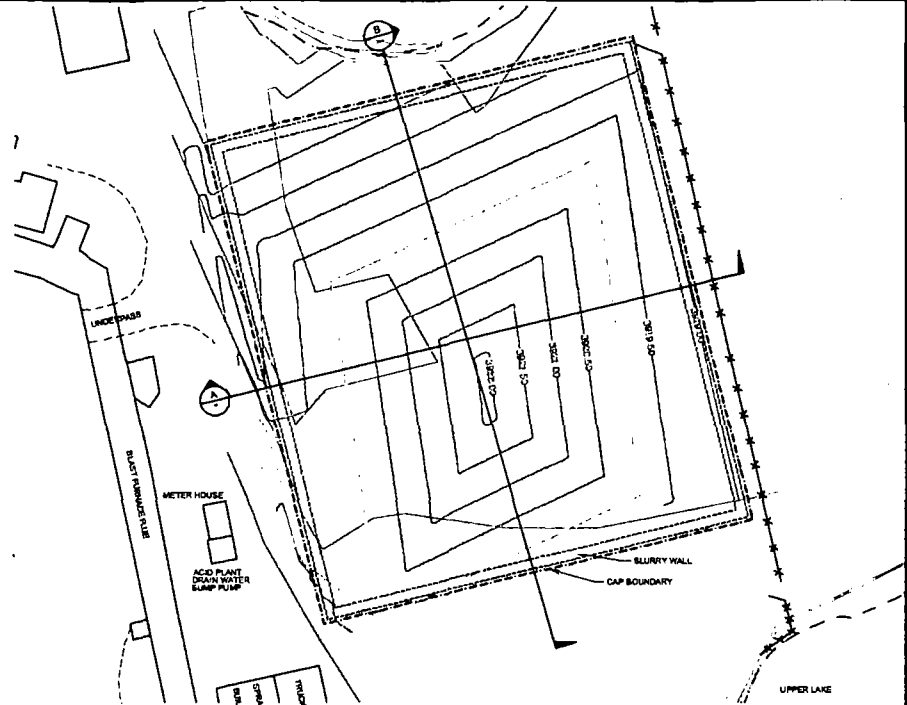
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2 DETAIL  
PERMANENT CAP  
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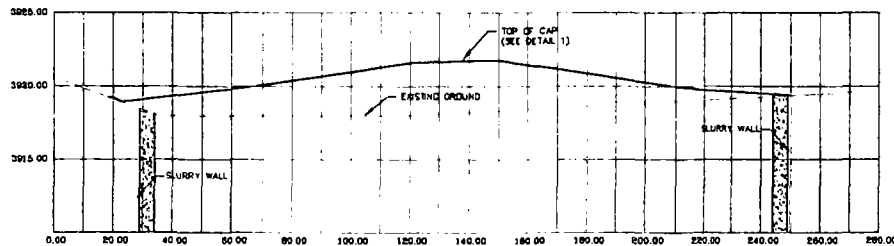


3 DETAIL  
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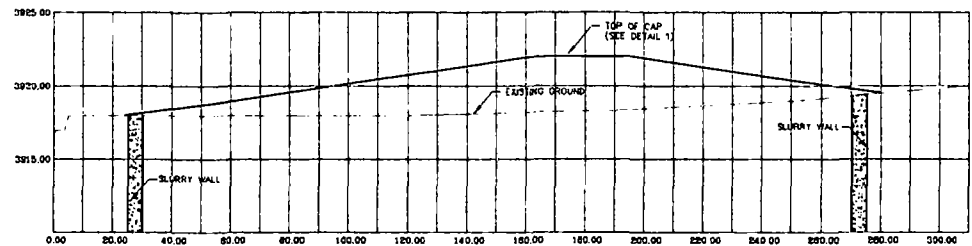
SEDIMENT DRYING AREA - PLAN VIEW

SCALE: 1"=20'  
DRAINAGE PLAN



SEDIMENT DRYING AREA - SECTION A

SCALE: 1"=20' (1"=100'  
DRAINAGE PLAN



SEDIMENT DRYING AREA - SECTION B

SCALE: 1"=20' (1"=100'  
DRAINAGE PLAN

NO.	BY	DATE	DESCRIPTION	NO.	BY	DATE	DESCRIPTION
1				1			
2				2			
3				3			
4				4			
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6				6			
7				7			
8				8			
9				9			
10				10			

SCALE VERIFICATION  
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ORIGINAL DRAWING  
0 1  
IF NOT ONE INCH ON  
THIS SHEET, ADJUST  
SCALE ACCORDINGLY  
SCALE: AS NOTED

Project No. 0002  
DRAWN BY: JMM  
CHECKED BY:  
APPROVED BY:  
Hydrometrics, Inc.  
Consulting Scientists and Engineers  
Helm, Montana Street  
PO Box 200  
Helena, Montana 59601

ASARCO INCORPORATED  
EAST HELENA PLANT  
SEDIMENT DRYING AREA  
CAPPING PLAN

DRAWING FILE NUMBER  
805201H003.dwg  
AUTOCAD 2004 PLANNING/DESIGN  
SHEET NUMBER  
1  
REV